OPERATION
AND
SERVICE MANUAL
T.O.S. NO. 5

MODEL CDH-1.0 MHZ-X1
PLUG-IN HARMONIC MARKER

Telonic® INDUSTRIES, INC.

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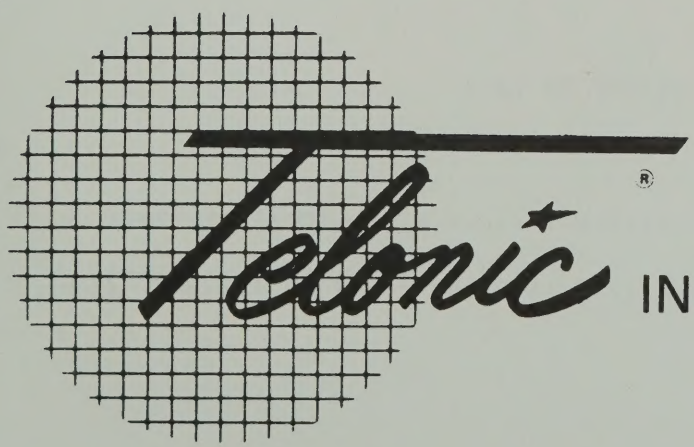

INDUSTRIES, INC.

WARRANTY

TELONIC INSTRUMENTS AND ACCESSORIES

Products manufactured by TELONIC INDUSTRIES, INC. are guaranteed against defective materials and workmanship for a period of one year (vacuum tubes excepted) from date of purchase. This warranty does not apply to instruments that have been altered, improperly handled or damaged in any way beyond our control.

Instruments must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

CHANGES IN SPECIFICATIONS

The right is reserved to change the published specifications of equipment at any time, and to furnish merchandise in accordance with current specifications, without incurring any liability to modify equipment previously sold.

RETURNING EQUIPMENT TO FACTORY

Factory service is available for repair and readjustment of this instrument. However, a description of the trouble, plus the MODEL AND SERIAL NUMBERS of the unit should be forwarded FIRST, whereupon instructions for correcting the trouble OR authorization for returning the equipment will be given. This applies to all units, whether under warranty or not.

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HARMONIC MARKER

SECTION I

GENERAL INFORMATION

1-1. SPECIFICATIONS.

1-2. Table 1-1. lists the specifications for the CDH-1.0 MHz-X1 HARMONIC MARKER.

TABLE 1-1.

Specifications	
Crystal Accuracy	± 0.005%
Frequency Range	Fundamental to 1000 MHz
Marker Width	The width of the markers depends on the marker amplifier circuitry in the sweep generator and is adjustable at the MARKER SHAPER Control on the front panel of most instruments.
Marker Amplitude and Signal to Noise Ratio	The amplitude and signal to noise ratio of the markers also depend on the sweep generator. With a typical Telonic Sweep Generator, a clear marker will be produced by these units over the entire specified frequency range. A clear marker is considered to be one with at least 0.2V peak to peak amplitude and a signal to noise ratio of at least 10 to 1.
Voltage Requirements	B+ 100V at 15mA. Filaments 6.3V at 750mA.

1-3. DESCRIPTION.

1-4. The Telonic CDH HARMONIC MARKERS are crystal-controlled plug-in units that produce birdy-type markers at the fundamental and all harmonic frequencies to 1000 MHz. These units are designed for use with Telonic Sweep Generators. The marker frequency in megahertz can be identified by the numerals following the letters CDH.

1-5. These units consist of a crystal oscillator, a harmonic generator, a mixer, and a video amplifier; all contained in one "plug-in" unit occupying two marker sockets on the Telonic Sweep Generators. The oscillator is an electron-coupled Pierce circuit with the screen grid of the 6U8 acting as the oscillator plate. The output from the oscillator is fed to a two stage harmonic generator and then to a dual diode mixer where it is combined with a signal from the sweep oscillator. The resultant heterodyne signals or "beats" are then amplified in a video amplifier and fed through a low-pass filter to the Birdy-By-Pass Amplifier in the Sweep Generator.

1-6. The crystals used in this unit are manufactured specifically for the associated oscillator circuitry. Proper allowance has been made for the capacitance of the crystal holders and other reactive properties of the oscillator section.

1-7. The dual diode mixer circuit is engineered for harmonics of nearly constant amplitude over the entire range. High order harmonics sufficiently strong for a clear marker up to 1000 MHz are available from all these units.

SECTION II

INSTALLATION

2-1. GENERAL.

2-2. This plug-in unit can be inserted in any two of the eight plug-in sockets, built-in on all Telonic Sweep Generators, that will provide a termination for the sweep sample input and output connections. The sweep sample input (BNC jack) can be fed from either one of two sweep sample lines in the sweep generator or from the sweep sample output of an adjacent plug-in unit. The sweep sample output (BNC plug) should be connected to either one of the two BNC terminators on the chassis or the sweep sample input of an adjacent box, to provide a 50 ohm matched termination.

SECTION III

MAINTENANCE

3-1. GENERAL.

3-2. Maintenance of the CDH HARMONIC MARKERS will normally be limited to replacement of component parts worn out in normal use or damaged by overload, accident, etc. Since there are no adjustable components used in this unit, the major cause of poor operation can usually be traced to a defective tube or diode.

3-3. Weak harmonic output and noise are symptoms usually indicating a defective diode. The replacement diode should have a high front to back resistance ratio if optimum results are to be realized.

3-4. In the event replacement of a crystal is necessary, it is strongly recommended that the replacement be ordered from Telonic Industries, Inc. Specified accuracy may not be realized with crystals from other sources.

3-5. To avoid electrical shock and damage to the diodes, do not remove or insert the marker unit or change any component without first turning off the unit.

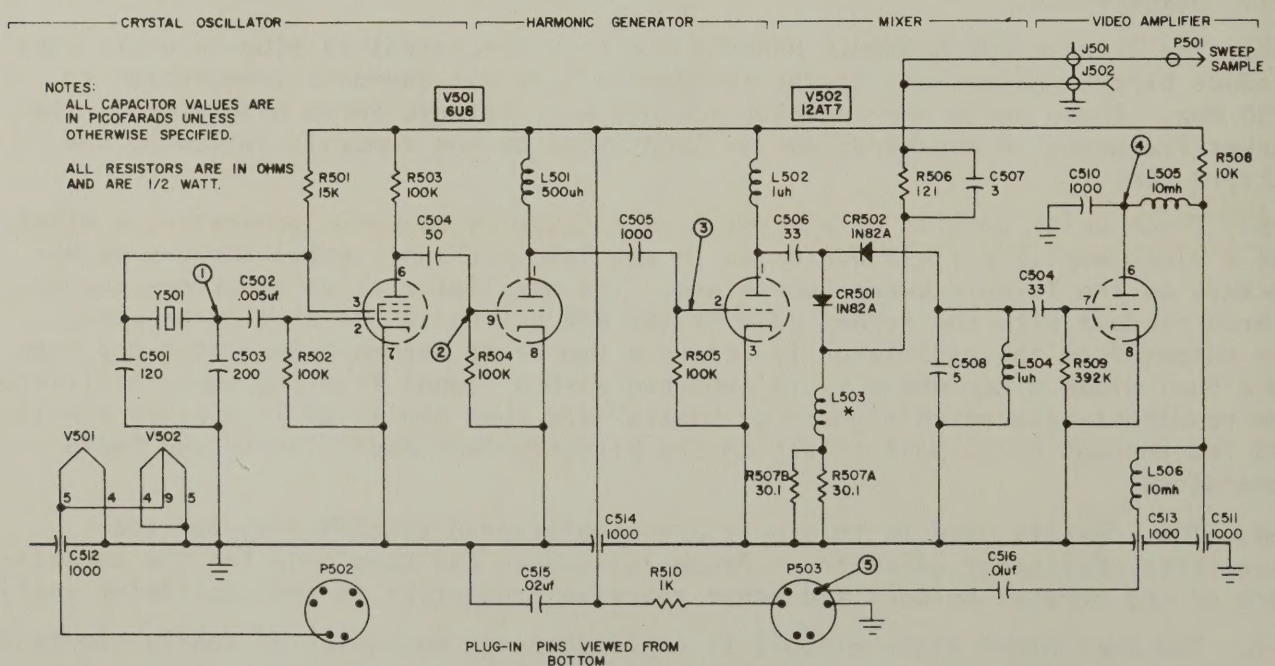
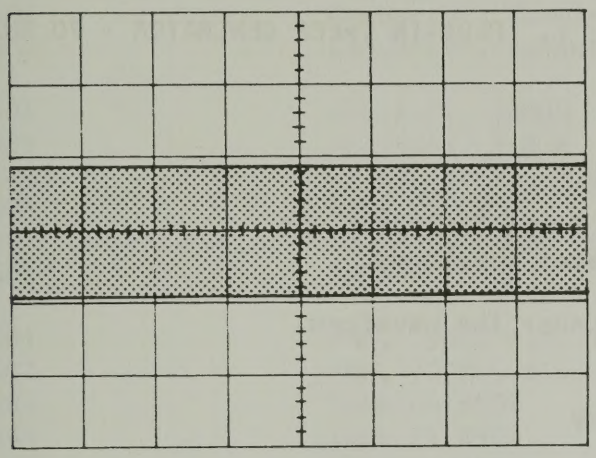


Figure 1. Schematic

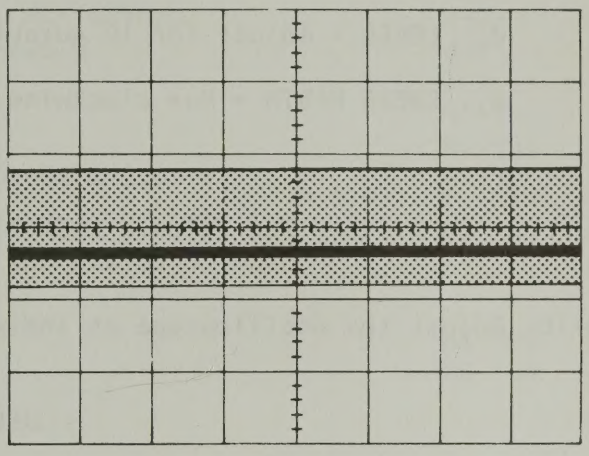
3-6. TROUBLESHOOTING (Refer to Figure 1)

3-7. Ensure that the Sweep Generator is operating properly before starting troubleshooting procedure.

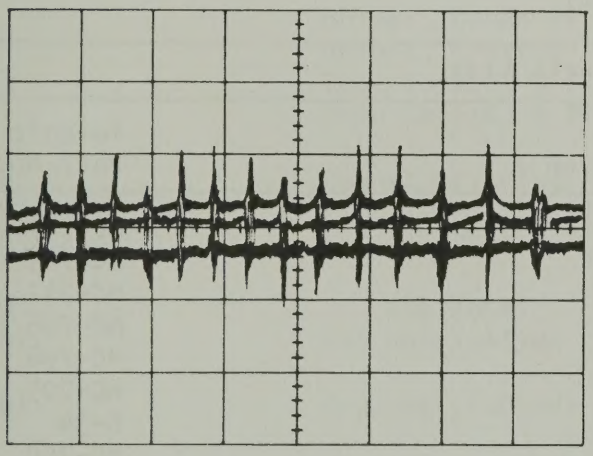
3-8. Figure 2 provides typical waveforms present at the various test points indicated on the schematic diagram.



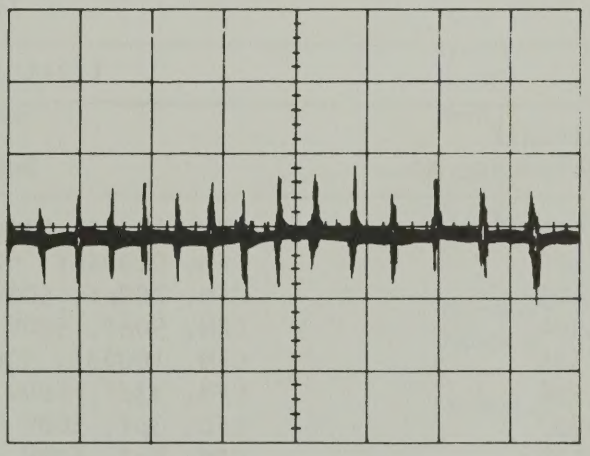
TEST POINTS 1, 2
Scale Level 0V, -30V
Vertical Sensitivity 1V/cm
Horizontal Sweep 1 msec/cm
Trigger - line



TEST POINT 3
Scale Level -40V
Vertical Sensitivity 5V/cm
Horizontal Sweep 1 msec/cm
Trigger - line



TEST POINT 4
Scale Level +68V
Vertical Sensitivity 0.005V/cm
Horizontal Sweep 1 msec/cm
Trigger - line



TEST POINT 5
Scale Level 0V
Vertical Sensitivity 0.005V/cm
Horizontal Sweep 1 msec/cm
Trigger - line

Figure 2. Waveforms

3-9. Adjust the Sweep Generator controls as follows:

a. SWEEP RATE - LINE
b. RF FUNCTION - SWEEP
c. MONITOR - RF 1
d. LEVEL - Adjust for 1V output
e. SWEEP WIDTH - Max clockwise
f. 1.0 MARKER SWITCH - ON
g. POWER - ON
h. SWEEP RATIO - EQUAL
i. PLUG-IN SWEEP GENERATOR - 70 MHz

NOTE

The Telonic L-5M Plug-in Sweep Generator was used to obtain the indicated waveforms.

3-10. Adjust the oscilloscope as indicated under the waveform.

SECTION IV

PARTS LIST

4-1. GENERAL

4-2. ELECTRICAL PARTS LIST. Table 4-1 provides the complete electrical parts list for the CDH-1.0 MHz-X1 HARMONIC MARKER

TABLE 4-1

Electrical Parts List

Circuit Reference No.	Description	Telonic Part No.
C501	CFM, 120pf, 500V	MC-707
C502	CFM, 0.005μf, 500V	MC-713
C503	CFM, 200pf, 500V	MC-712
C504	CFM, 50pf, 500V	MC-706
C505	CFM, 1000pf, 500V	MC-708
C506	CFM, 33pf, 500V	MC-705
C507	CFC, 3pf, 500V	C-34
C508	CFM, 5pf, 500V	MC-700
C509	Same as C506	
C510	Same as C505	
C511	CFCF, 1000pf, 1000V	MC-711
C512	Same as C511	
C513	Same as C511	
C514	Same as C511	
C515	CFP, 0.022μf, 600V	MC-710
C516	CFM, 0.01μf, 500V	MC-709

TABLE 4-1 (Cont)

Circuit Reference No.	Description	Telonic Part No.
CR501	DS, 1N82A/USA	MC-300
CR502	Same as CR501	
J501	Connector, Terminating, MX-1684A/U	J-54
J502	Connector, Recept., UG-625/U	J-7
L501	IF, R.F., 500μH	MC-502
L502	IF, R.F., 1.0μH	MC-501
L503	Fixed, Strap, 0.015 x 0.093 x 2.00	W-23
L504	Same as L502	
L505	IF, R.F., 10mH	MC-503
L506	Same as L505	
R501	RMF, 15KΩ, ±1%, 1/2W	MC-108
R502	RMF, 100KΩ, ±1%, 1/2W	MC-104
R503	Same as R502	
R504	Same as R502	
R505	Same as R502	
R506	RMF, 121Ω, ±1%, 1/2W	MC-100
R507	RMF, 30.1Ω, ±1%, 1/2W	MC-107
R508	RMF, 10KΩ, ±1%, 1/2W	MC-102
R509	RMF, 392KΩ, ±1%, 1/2W	MC-109
R510	RMF, 1KΩ, ±1%, 1/2W	MC-101
R511	Same as R507	
	Holder, Diode (2 Req'd)	S-9
	Holder, Crystal	S-18
	Tube Socket, 9 Pin (2 Req'd)	S-76
	Tube Shield, 9 Pin (2 Req'd)	S-81
P501	Connector, Plug	J-13
P502	Plug, Wafer, 6 Pin	S-12
P503	Same as P502	
V501	TE, 6U8 (USN)	MC-602
V502	TE, JAN/12AT7WA	MC-603
Y501	Crystal, 1.0 MHz	X-4-1.0

ABBREVIATION CODE

CFC	Capacitor, Fixed, Ceramic
CFCF	Capacitor, Fixed, Ceramic, Feed-Thru
CFM	Capacitor, Fixed, Mica
CFP	Capacitor, Fixed, Paper
DS	Diode, Semiconductor
IF	Inductor, Fixed
RMF	Resistor, Metal Film
TE	Tube, Electron